

APPENDIX E

DIRECT CONTACT

This portion of Appendix E explains the methods Montana Department of Environmental Quality (DEQ) used to develop direct contact risk-based screening levels (RBSLs) for Tier 1 of the risk-based corrective action (RBCA) process. The appendix is made up of tables and spreadsheets used to develop the RBSLs. The following is a brief explanation of these tables and spreadsheets. Data sources are provided in the spreadsheets and a reference list is provided at the end of the appendix. DEQ chose conservative parameters to develop RBSLs applicable to a wide variety of sites.

Table 1 provides a compilation of the chemical specific information used to develop the RBSLs and the actual direct contact RBSLs calculated for each compound.

The Volatilization Factors spreadsheet was used to calculate volatilization factor for the volatile analytes using the method provided in the Environmental Protection Agency (EPA) Soil Screening Guidance: Technical Background Document (EPA, May 1996). Volatile chemicals have been defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m³/mol) and a molecular weight less than 200 g/mole as defined in the Region IX Preliminary Remediation Goals (EPAIX, October 2004). Data sources are provided at the end of the spreadsheets.

The Age-Adjusted Factors spreadsheet was used to calculate age-adjusted factors for the soil ingestion, inhalation, and dermal contact exposure routes using the method provided in the EPA Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part B, Developing Risk-based Preliminary Remediation Goals) (EPA, December 1991) and the EPA Region IX Preliminary Remediation Goals (EPAIX, October 2004).

The Residential Scenario: Carcinogens spreadsheet was used to calculate RBSLs for residential exposure to carcinogens using the methods provided in EPA, December 1991. These RBSLs are based on a target risk of 1×10^{-6} , providing some assurance that overall site risks will not exceed 1×10^{-5} , and are applied to the top 2 feet of soil at sites where the current and reasonably expected future usage is residential.

The Residential Scenario: Non-carcinogens spreadsheet was used to calculate RBSLs for residential exposure to non-carcinogens using the methods provided in EPA, December 1991, EPA Region IX, October 2004, the Massachusetts Department of Environmental Protection (MADEP) Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of the MADEP VPH/EPH Approach, Final Policy (October 31, 2002) and the MADEP November 2003 Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH /APH Methodology. (Volatile Petroleum Hydrocarbons = VPH, Extractable Petroleum Hydrocarbons = EPH, and Air-Phase Hydrocarbons). These RBSLs are based on a target hazard quotient of 0.125 for each compound. There are eight possible non-carcinogens, including the non-target fractions, present in either gasoline or diesel. Therefore, a hazard quotient of 0.125 provides some assurance that the overall hazard index for a site will not exceed 1. These RBSLs are applied to the top 2 feet of soil at sites where the current and reasonably expected future usage is residential.

The Commercial Scenario: Carcinogens spreadsheet was used to calculate RBSLs for a commercial worker's exposure to carcinogens using the methods provided in EPA, December 1991. These RBSLs are based on a target risk of 1×10^{-6} , providing some assurance that overall site risks will not exceed 1×10^{-5} , and are applied to the top 2 feet of soil at sites where the current and reasonably expected future usage is commercial or industrial.

The Commercial Scenario: Non-carcinogens spreadsheet was used to calculate RBSLs for a commercial worker's exposure to non-carcinogens using the methods provided in EPA, December 1991 MADEP, October 2002, and MADEP, November 2003. These RBSLs are based on a target hazard quotient of 0.125 for each compound. There are eight possible non-carcinogens, including the non-target fractions, present in either gasoline or diesel. Therefore, a hazard quotient of 0.125 provides some assurance that the overall hazard index for a site will not exceed 1. The RBSLs are applied to the top 2 feet of soil at sites where the current and reasonably expected future usage is commercial or industrial.

The Excavation Scenario: Carcinogens spreadsheet was used to calculate RBSLs for an excavator's exposure to carcinogens using the methods provided in EPA, December 1991. These RBSLs are based on a target risk of 1×10^{-6} , providing some assurance that overall site risks will not exceed 1×10^{-5} and are applied to soil greater than 2 feet

below the ground surface at all sites where there is a potential for utility installation, pipe repair, or other excavation in the future.

The Excavation Scenario: Non-carcinogens spreadsheet was used to calculate RBSLs for a excavator's exposure to non-carcinogens using the methods provided in EPA, December 1991 and MADEP, October 2002 and MADEP, November 2003. These RBSLs are based on a target hazard quotient of 0.125 for each compound. There are eight possible non-carcinogens, including the non-target fractions, present in either gasoline or diesel. Therefore, a hazard quotient of 0.125 provides some assurance that the overall hazard index for a site will not exceed 1. The RBSLs may be applied to soil greater than 2 feet below the ground surface at all sites where there is a potential for utility installation, pipe repair, or other excavation in the future.

The Water Quality Guidelines for Non-Target Analytes spreadsheet was used to calculate RBSLs for non-target analytes in water using the methods provided in the EPA Drinking Water Regulations and Health Advisories (EPA, October 1996) and MADEP, October 2002 and MADEP, November 2003.

REFERENCES

- Environmental Protection Agency (EPA), December 1989. Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual Part A.
- EPA, December 1991. Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals).
- EPA, March 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons.
- EPA, May 1996. Soil Screening Guidance: Technical Background Document.
- EPA, October 1996. Drinking Water Regulations and Health Advisories.
- EPA, August 1997. Exposure Factors Handbook Volume I General Factors.
- EPA, December 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.
- EPA, July 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.
- EPA Region III, December 1995. Assessing Dermal Exposure from Soil.
- EPA Region IX, October 2004. Preliminary Remediation Goals.
- IRIS, January 2007. EPA's Integrated Risk Information System.
- Massachusetts Department of Environmental Protection (MADEP), October 2002. Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of MADEP VPH/EPH Approach Public Comment Draft.
- Massachusetts Department of Environmental Protection (MADEP), November 2003. Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology.
- Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG), July 1997. Selection of Representative TPH Fractions Based on Fate and Transport Considerations.